

TROPICAL PACIFIC AND INDIAN-OCEAN WARMING DURING 1997-98 INFERRED BY ASSIMILATING TOPEX/POSEIDON DATA INTO A NEAR-GLOBAL OGCM

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Sea level anomalies observed by the TOPEX/POSEIDON altimeter during 1997 and 1998, climatological mean temperature and salinity, and surface flux data are assimilated into a parallel version of the MIT ocean general circulation model (OGCM). The model has a near-global domain (80 deg S to 80 deg N), 1x0.3-deg grid in the tropics and 1x1-deg grid in the extra-tropics, and 46 vertical levels (levels are 10-m thick in the upper 150 m). The adjoint method is used to minimize model-data misfits by adjusting the initial temperature, salinity, and surface fluxes. The assimilation significantly improves estimates of the tropical Pacific circulation: standard deviation difference is reduced and correlation is increased relative to TOGA-TAO data which are not used in the assimilation. Through adjustment of wind stress, the assimilation regulates the timing and magnitude of equatorial Kelvin and Rossby waves as well as advection to produce a more realistic thermal structure (especially in the thermocline slope) and sea level associated with the warming both in the eastern equatorial Pacific and western equatorial Indian Oceans. Effects of the assimilation on tropical heat balance are quantified and dominant processes associated with the development of Pacific and Indian-Ocean warming are discussed.